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(19) (CA) **CANADIAN PATENT** (12)

(54) CURED TIRE AND METHOD OF ENGRAVING THE SAME

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**CURED TIRE AND METHOD
OF ENGRAVING THE SAME**

ABSTRACT

A method of engraving a cured tire by positioning the tire
5 relative to a laser beam to cause the laser beam to engrave the
sidewall surface or tread surface of the tire, and a cured tire
having a visible laser engraving thereon.

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CURED TIRE AND METHOD
OF ENGRAVING THE SAME

This invention relates to a method of engraving a vulcanized or cured tire and to a cured tire.

5 Heretofore, it has been common to form raised lettering on a tire by utilizing a mold having recesses which form the raised letters on the tire, and the raised letters are cured integrally with the tire when the tire is cured. Tires have also been made with recessed lettering thereon formed during curing by raised portions 10 of the mold. Such molds, however, are expensive to manufacture. Tires have also been made which have recessed markings placed thereon after curing by hot or cold branding techniques which generally do not provide sufficiently accurate markings.

It is an object of the present invention, therefore, to provide 15 a new and improved method of engraving a cured tire which avoids one or more of the above-mentioned disadvantages and limitations of prior methods of marking tires.

In accordance with the invention, the method of engraving a cured tire comprises exposing the cured tire to a laser beam and 20 changing the relative positions of the laser beam and the tire in such manner as to cause the laser beam to engrave the surface of the tire.

Also, in accordance with the invention, a tire comprises a cured tire having a visible laser engraving thereon.

25 For a better understanding of the present invention, together with other and further objects thereof, reference is made to the following description, taken in connection with the accompanying drawings, and its scope will be pointed out in the appended claims.

Referring now to the drawings:

30 Fig. 1 is a perspective view, partly diagrammatic, of apparatus useful in the method of the present invention;

Fig. 2 is an enlarged, fragmentary view of an engraved letter on a cured tire;

Fig. 3 is an enlarged, fragmentary, sectional view, partly diagrammatic, of the Fig. 1 apparatus engraving a tire;

Fig. 3a is an enlarged, fragmentary, sectional view, partly diagrammatic, of a laser beam from the Fig. 1 apparatus engraving 5 a tire;

Fig. 4 is an enlarged, sectional view of a portion of a cured tire having a groove laser-engraved therein, and

Fig. 5 is a fragmentary, perspective view, partly diagrammatic, of apparatus useful in the method of engraving the tread 10 surface of a cured tire in accordance with the present invention.

Referring now more particularly to Fig. 1 of the drawings, a cured pneumatic tire 10 of standard construction is mounted by means of a conventional chuck mechanism shown in simplified form, on the shaft of a motor 11. The motor 11 preferably is mounted on 15 a conventional 3-axis mill 12 for motion in the x, y, and z directions. The mill 12 may, for example, be a 3-axis numerical control tape controlled mill of a type sold by Boston Digital Corporation, Holliston, Massachusetts under the trademark BostoMatic.

A commercially available industrial laser 13, for example, of 20 the Everlase 150, a trademark, CO₂ type sold by Coherent Radiation Co., Palo Alto, California, is positioned for volatilizing the surface of the tire with its laser beam.

The method of engraving the cured tire 10 comprises exposing the cured tire to a laser beam and changing the relative 25 positions of the laser beam and the tire in such manner as to cause the laser beam to engrave the surface of the tire. The mill 12 and motor 11 of Fig. 1 preferably are controlled to change the position of the tire relative to the laser beam to cause the laser beam to engrave the sidewall surface of the tire.

30 In Fig. 1 the laser beam has engraved the indicia U N in the form of recessed letters on the sidewall as part of the brand name UNIROYAL, a registered trademark of Uniroyal, Inc.

The letter N is shown in enlarged view in Fig. 2, where it will be seen that the border 14 of the letter is a groove of the cross- 35 sectional shape generally represented in Fig. 4. The groove may, for example, be .060 inch deep and .050 inch wide at the top of the groove. As represented in Fig. 2, the portion 15 of the letter N

enclosed within the grooved border 14 is not recessed. However, the width and depth of the groove may be readily controlled as represented in Fig. 3 by adjustably positioning the tube 16 which holds lens 17 of the laser to change the position of the focal point 5 18 of the laser beam 19 and thereby control the size of the beam which strikes the surface of the tire. In some cases, the entire surface of the letter N may be recessed.

The cured tire may be marked with the brand name after classification for uniformity or for blemishes or the like. Tires 10 from the same mold and with a similar appearance may be given different brand names, if desired.

Laser engraving of the cured tire may also form, for example, a logo, a signature, a picture or decorative recessed pattern in the sidewall surface. Also, a brand name may be modified by, for 15 example, molding a one-word portion of the name and adding a second word by laser engraving after the tire has been cured.

The depth of recessed letters on the sidewall of the tire may be controlled, for example, by appropriate control of pulsed operation of the laser beam or control of the relative speed of motion of 20 the tire. Color contrast between the recessed letters and the background may be provided by, for example, engraving through a black cover strip over a white sidewall layer to expose recessed white letters against a black background. As represented in Fig. 3a, the laser beam 19 has a focal point 18 adjusted to cause the 25 beam to engrave through a black cover strip 24 over a white sidewall layer 25 to expose a recessed white border 14a similar to the border 14 of a letter such as represented in Fig. 2.

Referring now to Fig. 5 of the drawings, the cured tire 21 is mounted for rotation by a suitable chuck mechanism 21a, shown in 30 simplified form, on the shaft of a motor 20 mounted on a 3-axis numerical control tape-controlled mill 23. The method includes the step of exposing the tread surface of the tire to a laser beam and the step of changing the relative positions of the laser beam and the tire in such manner as to cause the laser beam to engrave the 35 tread surface of the tire. As represented in Fig. 5, the laser beam may engrave slits 22 or sipes in the tread surface. The laser beam may also be adjusted to engrave wider grooves in the tread surface.

Thus, an existing tread surface pattern may be modified or a tread having no pattern thereon may be laser-engraved with a pattern.

While there have been described what are at present believed to be the preferred embodiments of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore, aimed to cover all such changes and modifications as fall within the true spirit and scope of the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. The method of engraving the sidewall of a cured tire comprising:

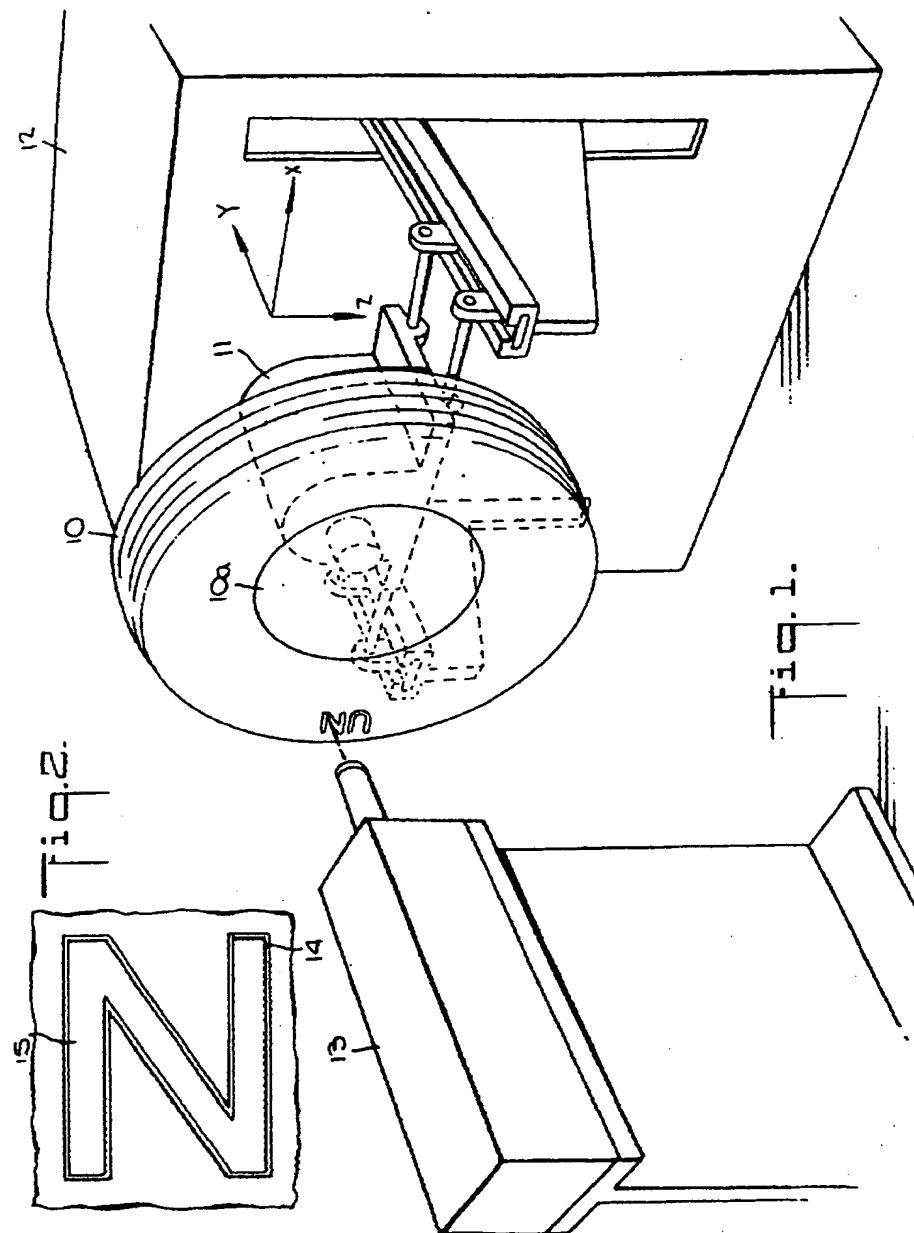
exposing the sidewall surface of a cured tire to a laser beam; and changing the relative positions of the laser beam and the tire in such manner as to cause said laser beam to form indicia in the sidewall of the surface of the tire, said indicia being recessed letters in which only the borders of the letters are recessed.

2. A cured tire made in accordance with the method of claim 1, said tire having a visible laser-engraved brand name thereon.



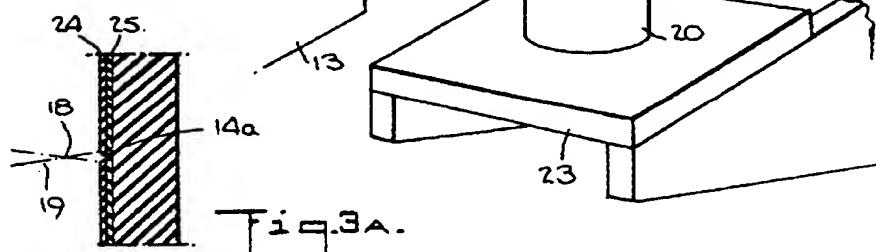
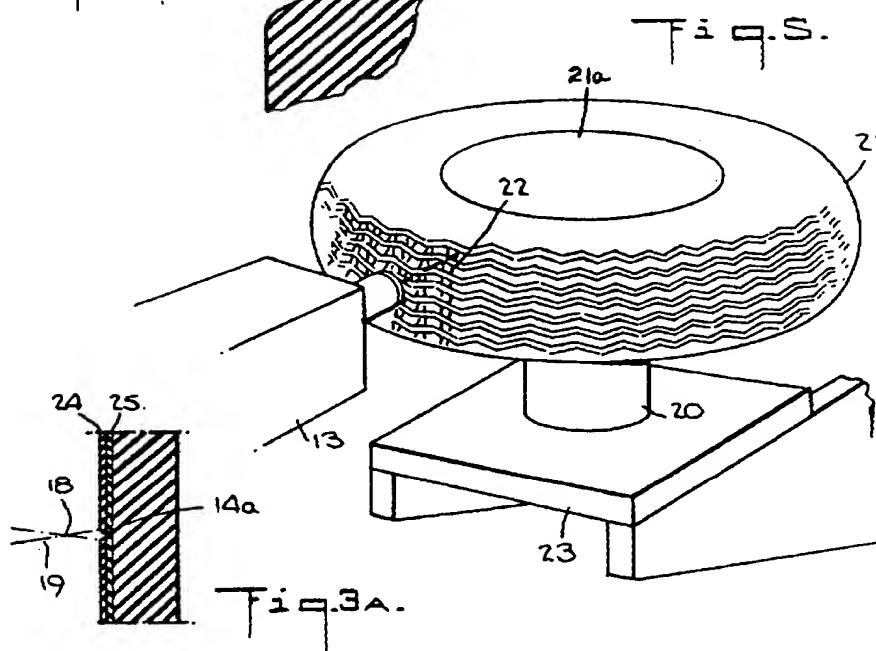
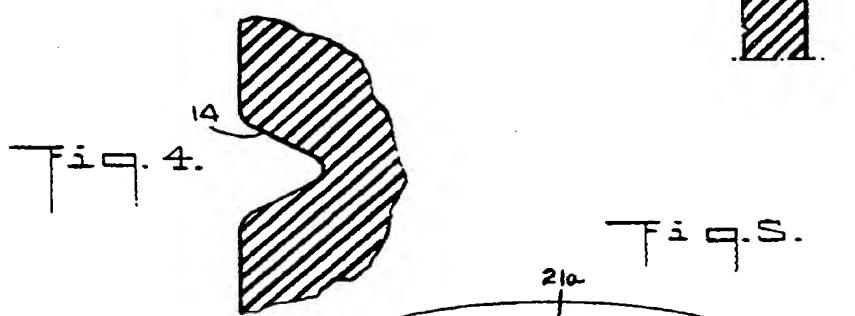
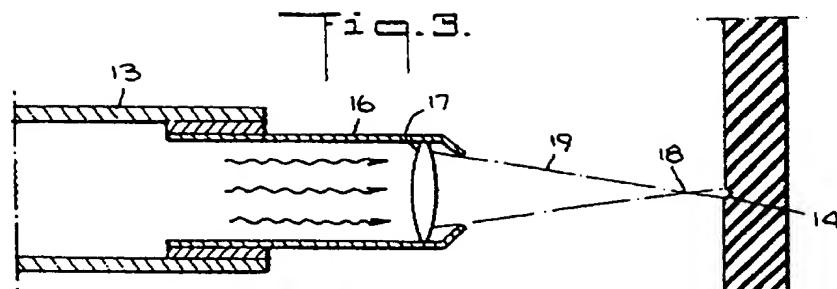
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